

Pre-AP Geometry Date_____ 5.2 Notes
Bisectors of a triangle (pp 272-274) Page 1 of 5

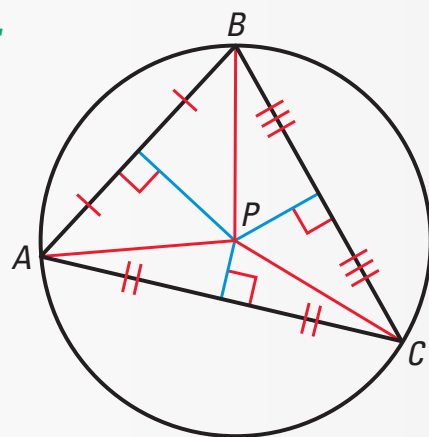
- I can define a concurrent lines and identify the point of concurrency.
- I can state the point of concurrency of perpendicular bisectors and angle bisectors of a triangle.
- I can state where the point of concurrency of perpendicular bisectors will be for types of triangles.
- I can state and apply the concurrency of angle bisectors and perpendicular bisectors.
- I can solve problems and perform proofs with perpendicular bisectors of triangles.

THEOREM

THEOREM 5.5 *Concurrency of Perpendicular Bisectors of a Triangle*

The perpendicular bisectors of a triangle intersect at a point that is equidistant from the vertices of the triangle.

$$PA = PB = PC$$

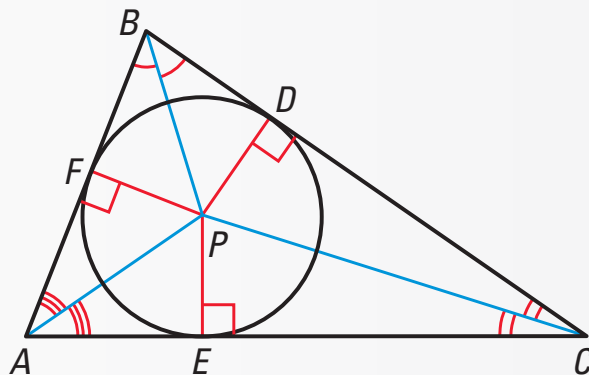


THEOREM

THEOREM 5.6 *Concurrency of Angle Bisectors of a Triangle*

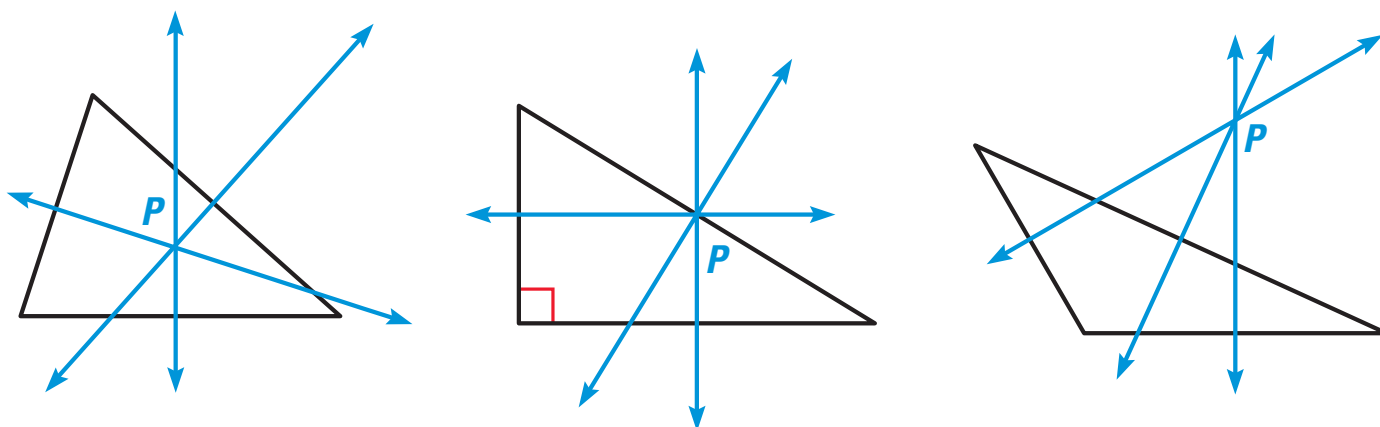
The angle bisectors of a triangle intersect at a point that is equidistant from the sides of the triangle.

$$PD = PE = PF$$



When three or more lines (or rays or segments) intersect in the same point, they are called **concurrent lines** (or rays or segments). The point of intersection of the lines is called the **point of concurrency**.

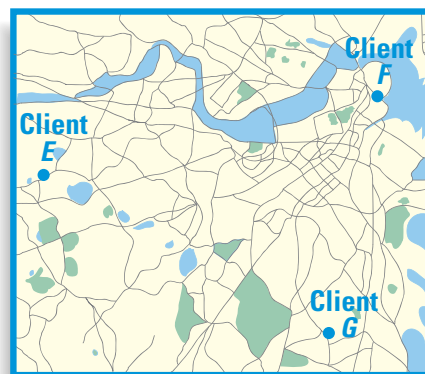
The three perpendicular bisectors of a triangle are concurrent. The point of concurrency can be *inside* the triangle, *on* the triangle, or *outside* the triangle.



EXAMPLE 1 Using Perpendicular Bisectors



FACILITIES PLANNING A company plans to build a distribution center that is convenient to three of its major clients. The planners start by roughly locating the three clients on a sketch and finding the circumcenter of the triangle formed.

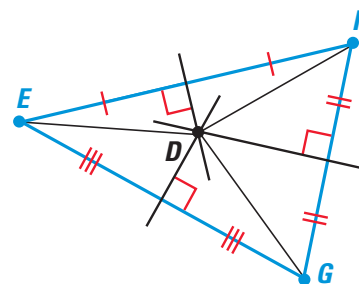


- Explain why using the circumcenter as the location of a distribution center would be convenient for all the clients.
- Make a sketch of the triangle formed by the clients. Locate the circumcenter of the triangle. Tell what segments are congruent.

SOLUTION

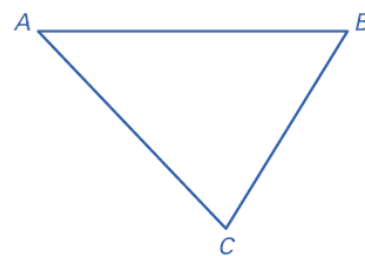
- Because the circumcenter is equidistant from the three vertices, each client would be equally close to the distribution center.
- Label the vertices of the triangle as E , F , and G . Draw the perpendicular bisectors. Label their intersection as D .

► By Theorem 5.5, $DE = DF = DG$.



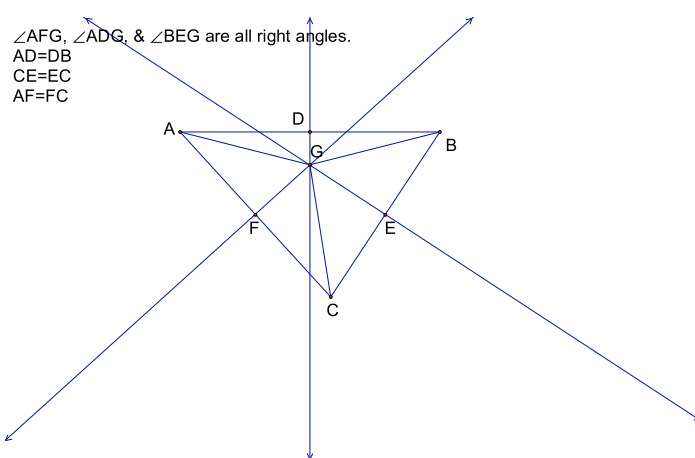
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Three people need to decide on a location to hold a monthly meeting. They will all be coming from different places in the city, and they want to make the meeting location the same distance from each person.

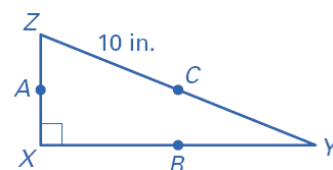


1. Explain why using the circumcenter as the location for the meeting would be the fairest for all.

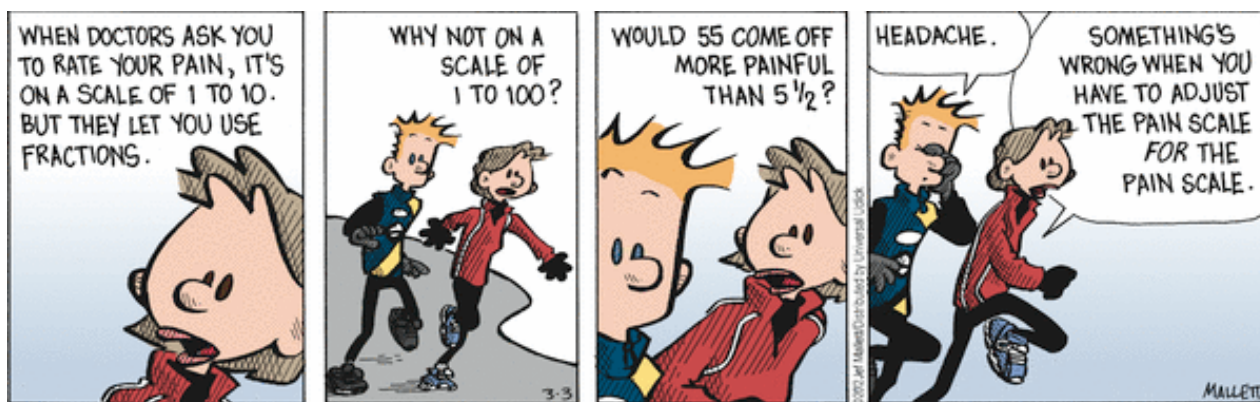
2. The triangle with the circumcenter constructed is shown. Label the circumcenter. State which segments (that aren't labeled) are congruent.



3. Which point is the best spot for placing a sprinkler to water the plants located at point X, Y, and Z?



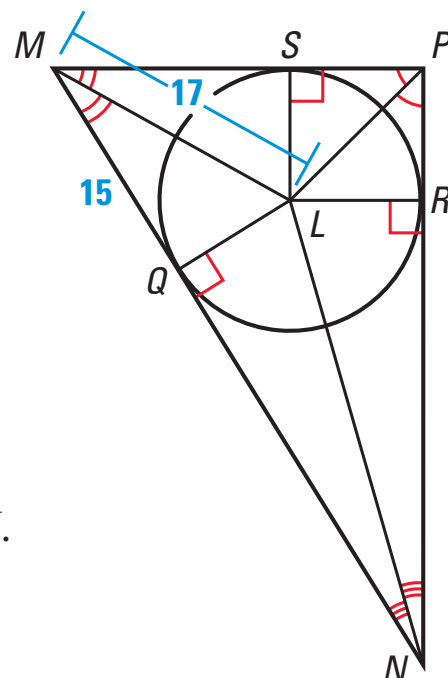
4. If the sprinkler covers a circular region with a radius of 15 in., will the water reach all three plants?



EXAMPLE 2 *Using Angle Bisectors*

The angle bisectors of $\triangle MNP$ meet at point L .

- What segments are congruent?
- Find LQ and LR .



SOLUTION

- By Theorem 5.6, the three angle bisectors of a triangle intersect at a point that is equidistant from the sides of the triangle. So, $\overline{LR} \cong \overline{LQ} \cong \overline{LS}$.
- Use the Pythagorean Theorem to find LQ in $\triangle LQM$.

$$(LQ)^2 + (MQ)^2 = (LM)^2$$

$$(LQ)^2 + 15^2 = 17^2 \quad \text{Substitute.}$$

$$(LQ)^2 + 225 = 289 \quad \text{Multiply.}$$

$$(LQ)^2 = 64 \quad \text{Subtract 225 from each side.}$$

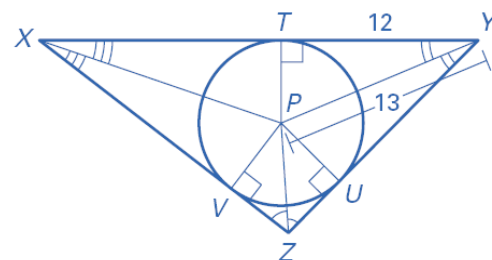
$$LQ = 8 \quad \text{Find the positive square root.}$$

► So, $LQ = 8$ units. Because $\overline{LR} \cong \overline{LQ}$, $LR = 8$ units.



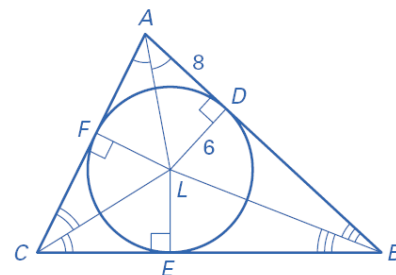
The angle bisectors of $\triangle XYZ$ meet at P.

5. What segments are congruent?



6. Find PT & PV.

7. The angle bisectors of $\triangle ABC$ meet at L. Find AL & FL.



8. What name is given to 3 or more lines that intersect at one point?

